Research on Virtual Reality Creation of Ink Robot

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Abstract

The application of digit to ink painting first derived from Shanghai Film Studio in China in the 1960s and its first ink-animation "Little tadpole looking for Mom" had a great performance and won many international awards.The purpose of this study is to develop VR virtual reality ink animation movies., This study uses the ink painting robot works created by the author in 2011, the study has tried to make Virtual Reality (VR) movies and VR ink Virtual Reality in 2019. By applying the ink painting linear and ink rhyme elements to bring ink creation into the performance of the virtual world as well as to virtualize a new visual multimedia world of ink and ink animation and bring new creative thinking and aesthetics to ink art.

Keywords: Ink Animation, VR Virtual Reality, VR movie

Chapter I. Introduction

1 Motivation of Study

In the 1970s, due to animation techniques, in order to present the ink and whitening effects of ink paintings and the linear expression and the spatial connotation of white and white of ink paintings, ink animations were all made in single frame which took lots of time and work such as "Little tadpole looking for mom" and "Shepherd's Flute." In recent years, with the progress of computer graphics software and the aid of drawing software, ink animation works shown in 3D were then made. For example, "Long River of Wisdom - Electronic Dynamic Edition Qingming Shanghai Map" was exhibited in the 2010 Shanghai World Expo. Making ink animation in 3D ink calligraphy by applying 3D software had then become a trend. A further development will be the application of technologies of Virtual Reality, Augmented Reality, and Mixed Reality to achieve a new era of ink creation media.

The category of VR is no longer limited in the range of 3G: GAME (Video Game) GAMBLING and GIRE (erotic).(note 1) The application will be extended to teaching, medical science, interior design, merchandises exhibition and even to video conferences. And movies and television shall become a major trend. In comparison with the current 3D movies, VR360 movies shall make watchers feel more immersive. Since the first-person perspective can be freer and more diversified, it is believed that it shall be more popular in the near future, which shall bring us human beings a new and innovative life or visual enjoyment.

International media said that 2016 was the initial year of VR. In 2017, director Cai Ming-liang's work "Home in Lanruo Temple" was nominated shortlisted by Venice Film Festival. In July 2019, Taiwan's most popular VR movie "Three Souls VR" news was very popular at that time. In May 2019, after two-year hard work, the study's work "PRAJNA PARAMITA" VR ink animation movie won six nomination of the international movie show, among which, two won the best VR movies. The study is to confer the application of Virtual Reality technology to make ink paintings VR movies and the aesthetics and new development study of ink paintings in the future.

2. Purpose of Study

(1) To Explore Evolution and Future of VR

VR is the abbreviation of Virtual Reality, which is called Virtual Reality in Chinese. The name was originally proposed by Jaron Lanier, founder of VPL Research Company in 1989, while it was also named Virtual Environment (VE) (Note 2)   Through computer,

Note 1: SHIN KIYOSHI (2017) "VR Shock" Taipei City: Cite Publishing Ltd Page 3

Note 2: Xu Zhao-ji, Ma Jun, He Zhong, Liu Xiaoyu (2017) "Virtual Reality" Taipei: Top Team. Page 1-3

cyberspace and a head device called HMD (Head Mount Display), VR allows the viewer to enter a virtual world of visual simulation, which makes the viewer think that he is in the virtual created real world.

In 1955, Morton Heilig set up a prototype machine 'Sensorama'. The viewer sat in the machine and watched the short film riding a motorcycle on the road in Brooklyn, which allowed the viewer to immerse himself in the fast-riding feeling of the virtual motorcycle to feel the wind, smell, and shocked sound. This can be regarded as the beginning of VR equipment (Note 3) Until 2015, OnePlus became the first company using VR to launch products, and then companies like HTC, SONY, SAMSUNG, LETV, ANTVR, DEEPOON, and AVEGANTGLYPH. had invested in research and development. Taking HTC's VIVE brand as an example, so far it has developed its second generation of Bluetooth wireless headsets, and even Japan's FOVE has actively developed eyes tracking technology. (Note 4) In the future, major manufacturers will surely develop newest equipment those scales are light and convenient and can enter virtual reality without a computer, and there will even be united specifications.

(2) Current Performance of VR movies

VR movies are virtual reality movies, but this virtual reality may also be real world virtualization, not necessarily designed by the scene designer, as long as the scenes are taken by 360-degree panoramic camera to be made into VR movies through the computer. VR movies must be more stereoscopic and more realistic than any 3D movies. Many movies are called the first VR movies. In 2014, Chinese-born director Lin Yi-bin cooperated with Google ATAP team to produce a 4 minute-53 second VR short film "HELP." In December 2016 "Jesus VR - The Story of Christ Jesus VR - The Story of Christ" was the first VR feature film, created by Autumn VR and VRWERX, with a 90- minute length. In 2017, Cai Ming-liang's "Home in Lanruo Temple" is the first Chinese VR film. Later on, VR movies have sprung up, and even many international competitions have set up VR movie competitions.

In 2017, Thierry Frémaux, art director of Cannes Film Festival pointed out that "VR is no longer just a technical means, it has become an art." (Note 5) The impacts of VR movies on movies are: 1. The audience appreciates the change of film modes. The audience is no longer

just sitting in a chair watching a movie. It is possible to stand, sit, lie down and even take actions. 2. It has subverted traditional vision. The angle of viewing may no longer be a single angle or just the director's point of view. They have diversified-angles to see the story, because VR movies are 360-degree virtual reality scenes.

Note 3: Cai-hua Limited Lab, Han Yuling (2016) "VR Comes" Taipei: Souler Culture Page 044

Note 4: SHIN KIYOSHI (2017) "VR Shock" Taipei City: Cite Publishing Ltd. Page 158-159)

Note 5: Zeng Yi "Between narrative and virtual: How does VR affect the film industry? " https://www.bnext.com.tw/article/45511/how-vr-have-the-impact-on-the-film-industry

(3) To develop and experiment VR ink animation film

A contemporary Chinese popular artist: Mr. Yang Yong-liang believed that ink painting had entered a dead end, so it was necessary to inject new life through new media. (Note 6) The study will develop experimental ink painting and attempt to make 3D electrographic animation software to be applied to each other, to develop VR virtual reality ink paintings, with updated thinking and visual ink animation, and to develop another ink painting performance or new era performance. Eventually, the study implements to develop the application, temporal spirit and creativity of VR ink works through the verification of developing ink animation.

3. Method of Study

(1) Analysis Method of Content

The first 2D ink animation was a 3D ink animation "Little tadpole looking for Mom" in 1960. 3D ink animation was produced in 2003. "Summer" produced by Universal Digital Corporation Xu Yi was eight years late than the world's first 3D animation "Toy Story," and it was 9 years later the first 3D animation "Space Warrior" in China. It shows that the 3D ink animation did encounter a considerable bottleneck at the beginning. Basically, modern ink animations are modeled by applying 3Ds MAX or MAYA electrographic software to create characters and other models, and then paste them with ink, and then perform lighting, rendering, post-production synthesis, color correction, and light effects and rhythm control to realiz the true reproduction of people, animals, and scenes, etc., as well as create a new artistic

effect of ink painting (Note 7)

(2) Case Study Method

Yang Yongliang, a contemporary Chinese popular artist: was born in Jiading in 1980, Shanghai, and graduated from the Shanghai Design Institute of the China Academy of Art in 1999. He started the experiment and creation of modern art in 2005 and had two video works based on Chinese landscapes: "View of Tide" (Fig. 1) and "Castle in the Sky." His first VR work was exhibited at the White Rock Gallery in Taipei from January 13 to March 4, 2018. (Fig. 2) Both received good reviews and market reactions.

Note 6: Artemperor Art Network / Pool Interview: Yang Yongliang https://www.youtube.com/watch?v=UFeSoI7ITe8

Note 7: Ani-Jam Animated Sauce "Presence and Life of Ink Animation": From hand-painting to 3D painting, where is the future? 》https://www.bilibili.com/read/cv1018909/

Fig 1: View of Tide - Yang Yongliang 2012 Video Works

He is an artist famous for his ink and landscape video. He has photographed numerous construction sites and super-high buildings. He has applied a computer to post-process. The process uses basic elements and grammar of ink painting. They are even stacked and even broken. The images of high-rise buildings are stacked into islands, and the way of misplacement and juxtaposition is adopted to make landscape paintings, which also creates a mirage like castles in the air. The background of Chinese painting has made him apply these techniques to have a natural spirit.

His works have an interpretation to new thinking of ink painting. First, the digital production method creates a form of landscape which is amazing. Second, the production of graphic works by computer software, video animation, can still be regarded as animation in the form of ink. Third, his VR works tell us so that ink painting does not have to be done by pen, ink, paper, hand-painted to have the spirit of ink and appearance. The above three points can be regarded as the best way for me to develop my VR ink animation films.

Chapter II Documental Research

1.   Content of Ink Animation

Chinese ink painting: the linear beauty generated by pens, ink, paper, and enamel media characteristics, the use of black and white, the use of multi-angle perspective to form unique features of "feasible, considerable, swimmable, and viable" in ink paintings VR movies:

(1) **The beauty of linear virtual reality**: whether freehand or meticulous ink animation, there is obvious linear ink, whether it is white, dry or wet, it is very interesting.

(2) **Introverted oriental soundtrack**: the soundtrack of ink animation is dominated by oriental music, introverted and implicit.

(3) **Deep and distant space aesthetics:** the layout of the blank is not applied in the West. The virtual space aesthetics, the abstract time philosophy plus multi-view images, vivid and far-reaching, plus the space created by the shades of ink seems simple to create space, yet it is able to express the world (Note 8)

2. Application Status of Ink Animation

(1) The bottleneck of the development of ink animation:

A. Ink animation creation is cumbersome and time consuming, and it is difficult to be massly produced.

B. Ink animation is limited by Chinese traditional culture and it is not easy to promote developing derivative products.

C. Under the globalization process, European and American animations continue to be integrated with Chinese elements to obtain cultural recognition by the countrymen. For

example, Disney's "Mulan" animation, the oriental traditional story is not necessarily expressed by ink animation.

(2) Application Status of Ink Animation

At present, the application of ink animation is no longer limited to animated films, and its applicative level is also very wide as follows:

A. Giving ancient paintings a new life: apply science and technology such as giving new life to ancient ink paintings, and increase public interest such as an electronic dynamic version of "The Riverside Scene at Qingming Festival" exhibited in China's 2010 Shanghai World Expo China Pavilion.

B. New media for ink painting creation: modern ink creators are not necessarily limited to hand-painting of pen and ink, and can have a wider use of media such as: Yang Yongliang's series of View of Tide.

C. Film and television works: as an animation works, regardless of albums, short films, they are different expressions.

D. The use of education: for example, "Ancient Painting and Animation Series" of the Palace Museum is applied in education to enhance the fun of teaching and improve students' interest and motivation.

Note 8: Zhou Lan's Analysis of artistic conception in Chinese Ink animation movies with "Landscape" as an Example

http://m.xzbu.com/7/view-8614013.htm

E. Advertisement application: for example, the New Year's Eve film produced by the Hong Kong Jockey Club in the Year of Horse is a 3D ink animation created by Xu Beihong's ink horse works, which is very attractive to the world. (fig. 3)

F. Video game design: more and more martial arts fighting video games are produced in the form of ink animation, which can better express the spirit of the Eastern martial arts.

圖 3：3D 水墨動畫。

Chapter 3 Performance and results of Developing and Designing Ink VR Animation study

1.   Content of VR Ink Animation

This VR ink manuscript is taken to my ink painting "PRAJNA PARAMITA" in 2011. This work is 120 cm high and 90 cm wide. It is a gold ink painting. The meaning of the work: PRAJNA PARAMITA is the central idea of Buddhism including: prajna, emptiness, meditation and love, which means that by the self-cultivation of the mind, surpassing the reincarnation of life and death, one can reach the limit of liberation.

The emergence of robots is necessary for future human life. The invention of robots is expected to be related to long-term caring, service industry and military. Therefore, the robot is not entirely a murderer in the science fiction film. The technology comes from human nature. Invention is for the convenience and progress of human beings. Robots are bound to benefit people. This is similar to the heart of Guanyin's compassion and love for the world. Butterfly fish is not only a technology but also a dream, all of which will be just around the corner. The future of technology and religion may continue to go hand in hand in conflict. The robot is named: Xiao Qiao, a female robot, 168 cm tall. There are horns on behalf of all the information transmission are included. The horn shape also represents the hard-working care robot, and its tail shows a little magic while compassion is under Buddhism.

Artists often rely on modern images or mind images, and ink paintings are oriental media. Buddhism is also a traditional oriental religion. It applies modern technology and virtual reality technology to combine the two, and uses the future technology robot as the ink theme to present new ink animation, opening up new topics and visual effects.

Storyboards interpretation of "PRAJNA PARAMITA" VR Ink Animation:

	Plot	Storyboard time	Meaning
Scene 1	Heaven & Earth are gradually brightened by black	0-10 seconds	world chaos first opened
	Raining down to the ground	0-1 minute	rain nourishes the earth
	108 lotus flowers and four huge lotus flowers rise slowly from the pool	1 m to 1 m 47sec	108 stands for all things and the universe receives water.
	6 butterfly fish appeared, 3 ink butterfly fish, 3 colorful ink butterfly fish.	1 m 47sec starts	Six roads run between Heaven & Earth, and they are right by Dharma.
	4 robots rise from four large lotus flowers, holding water in both hands and rising to the end with their hands clasping together.	2m40sec-5m18sec	Future technology appears, but religion still needs to educate people
Scene 3	3 flying fairies appear	3m30sec to the end	Whatever in the past, present or future, Dharma continues
Scene 4	Water Moon Guanyin emerges from the wall murals	4m20sec	When the righteousness is recognized by all things in the earth, the more Dharma can appear.
	Guan Shiyin, right palm of the hand, appears butterfly fish	4m40sec	All things welcome Guanyin
	Guan Shiyin right palm butterfly fish gradually into ink lotus	5m35sec	All things are sublimated by Dharma
Scene 5	Heaven & Earth gradually turn	6m-6m20sec	All things in the world

	white		are clear and clear

"PRAJNA PARAMITA" Objects numbers in VR Ink Animation

Quantity	Meaning
3 (3 flying fairy)	Buddhist 3 treasures, so-called 3 treasures referring to Buddha, law, and shackles. It also represents the past, future, and present 3-life 10-way Buddhas.
4 (4 robots)	4 holy monks: bitter, episode, extinction, Tao.
6 (6 butterfly fish)	6-word mantra or six-word mantra, Om Mani Padme Hum 6 Roads, Heaven, Ashura Road, Humanity, Animal Road, Hungry Ghost Road and Hell Road Sadindriya: eyes, ears, nose, tongue, body, meaning Six dusts: color, sound, fragrance, taste, touch, method Six Senses: Eye, Ear, Nasal, Tongue, Body, Consciousness
108 (lotus)	Number of heaven & earth universe Total number of Sadindriya, 6 dusts & 6 senses is 18 areas, plus the past, the present and the future 3, 3 lives times eighteen areas is 54, and then times two rounds of life & death is 108. 6 directions "East, West, South, North, Up and Down" in the space, each of which has 6 directions of "East, West, South, North, Up and Down". To calculate, there are six directions ($6 \times 6 = 36$), and 36 directions times 3 (the past, the present and the future) equals to 108.

2. Application of Virtual Reality "VR"

The space of VR film "PRAJNA PARAMITA" is set to a 5X5X5M room, which is intended to create a Buddhist space like the Dunhuang Grottoes. The surrounding murals are famous for the brilliant and famous temple murals since ancient times. For example, the front wall is Water Moon Guanyin image of the Fahai Temple in Beijing Temple in Hebei Province, and the left and right sides are the north wall of the Fahai Temple "Sakka Brahma Buddha Guardian Painting ". The back wall is the sarcophagus of the Guangshengxia Temple, which

is now in the Nelson-Atkins Museum of Art in Kansas City, Missouri. The Weishuiyue Guanyin statue uses Water Moon Guanyin wood carvings (shown as fig.) that were also collected in the original Nelson-Atkins Art Museum in China.

The software used in the study is Photoshop, 3ds Max, and Unity, etc. Adobe Photoshop was designed in the early days. 3Ds Max was used in modeling, and Unity is applied to create designs and projections in virtual reality. In this film, in order to present the author's original ink painting spirit, you can actually use electrographic software such as Photoshop or ink painting professional "Expresii", but I used 3Ds Max modeling and disassembly. The case model is actually on a rice paper to create Ink painting, and then scan the block on 3Ds Max modeling, so that you can faithfully represent the original ink painting of the original author.

3. Soundtrack

The background music of the VR film "PRAJNA PARAMITA" was taken from: "Meditation Kundalini" in the album "City by Night" by Neon Ridge. The music is licensed by ARTLIST Networks, Authorization No. 612088.

Neon Ridge is from Zurich, Switzerland. Two producers Mikael and Kaan express themselves in music by combining piano and folk songs, electronic music and film dynamics to create new electronic sounds.

Kundalini (Sanskrit: , English: Kundalini) means "Coiled Dragon." Its Sanskrit means curly and belongs to Indian yoga, which can be translated as "Coiled Dragon Yoga." It is meditative yoga, which is not only physical yoga but also singing yoga. The practitioners believe that by practicing yoga, you will be able to wake up Kundalini who is sleeping in your body. So it can pass through the midrib and eventually reach a realm of "Integration of body, mind and spirit."

Meditation Kundalini is a music based on cymbals, reaching the ethereal meditation realm through snoring. In the music they mentioned: elemental samples and meditation atmospheres evoke complex emotional perspectives from the dark a priori depth and intensity (Note 9)

It is an indispensable instrument in Buddhist music. The sentence in the Buddhist scriptures is completed by Bo or Muyu. The sound of the Bo is crisp and mellow, and the audio is extremely high. It is a very ancient instrument from India. There has been a ceremony of singing by Bo since ancient Buddhism. In this film, the Bo sound has the meaning of

meditation, Buddhism, and physical and mental well-being.

Note 9：https://soundcloud.com/neonridge/meditation-kundalini

4. Description of Results

"PRAJNA PARAMITA" VR film has been nominated by 13 international film festivals or best VR films until October in 2019. The winning entries are as follows:

(1) Pune Short Film Festival in India – On June 5, 2019, 9th Pune Short Film Festival in India was nominated. (Fig. 4)

(2) Calcutta International Cult Film Festival – on August 9, 2019 won the Best VR Film Award. (Fig. 5)

(3) L'Age d'Or International Arthouse Film Festival– awarded as the Best VR Film Award at the Film Festival held in L'Age d'O, India on August 9, 2019 . (Fig. 6)

(4) Indie Visions Film Festival (Independent Visual Film Festival) – was nominated on August 30, 2019, which was held by University of Virginia. (Fig.7)

(5) Moody Crab Film Fest-2019 in India – was nominate by the Fest, which was held in Punjab, India on September 3, 2019. (Fig. 8)

(6) Goa Short Film Festival (6th India Goa Short Film Festival) - on October 24, 2019, the Goa Short Film Festival was held in Maharashtra, India and it was nominated. (Fig. 9)

(7) World Film Carnival – The World Carnival Asia Film Festival in Singapore on November 7, 2019-won the best virtual reality film in October. (Fig. 10)

(8) World Film Carnival – The World Carnival Asia Film Festival in Singapore on November 7, 2019-won the best religious film in October. (Fig. 11)

(9) Florence Film Awards - on January 5, 2020 won the best fantasy short film at the Florence Film Awards Fantasy Short Film.(Fig. 12)

(10) Florence Film Awards - January 5, 2020 Shortlisted for experimental film at Florence Film Awards Fantasy Short Film.(Fig. 13)

(11) Rome Independent Prisma Awards - JShortlisted experimental films on January 5, 2020.

(Fig. 14)

(12) TRMF Animation Competition -Finalist cartoon on March 22, 2020.(Fig. 15)

(13) Accolade Global Film Competition -Won the best experimental film in Accolade Global Film Competition on March 23, 2020.(Fig. 16)

OFFICIAL SELECTION **Pune Short Film Festival** 2019	OFFICIAL SELECTION **Calcutta International Cult Film Festival** 2019	OFFICIAL SELECTION **L'Age d'Or International Arthouse Film Festival** 2019
Fig.4	Fig. 5	Fig.6
OFFICIAL SELECTION **Indie Visions Film Festival** 2019	OFFICIAL SELECTION **Moody Crab Film Fest** 2019 - Edition 2	OFFICIAL SELECTION **Goa Short Film Festival** 2019
Fig.7	Fig.8	Fig.9
OFFICIAL SELECTION **World Film Carnival - Singapore** 2019	OFFICIAL SELECTION **World Film Carnival - Singapore** 2019	OFFICIAL SELECTION **Florence Film Awards** 2020
Fig.10	Fig.11	Fig.12
OFFICIAL SELECTION **Florence Film Awards** 2020	OFFICIAL SELECTION **Rome Independent Prisma Awards** 2020	OFFICIAL SELECTION **TRMF Experimental Competition March** 2020
Fig.13	Fig.14	Fig.15

Fig.16

Chapter 4 Conclusion

VR technology is bound to be a great application in our future life, whatever in education, games, or film and television. In fact, many science-fiction films have already stated for wearable virtual devices long ago such as "Avatar" in 2009, which humans used wearable devices to enter another living body. In the same year, Bruce Willy starred in "Surrogates", which had the same model. Humans use brainwaves to manipulate individual robots for daily activities through wearable devices, and humans only need to stay at home. In 2018, Steven Spiel directed "Ready Player One" and tried to explore the situation when human beings were addicted to virtual reality. Life is like having drug and will be controlled by people. The fantasy of these films is possible. After all, technology is changing with each passing day. In April, 1973, Martin Cooper, an engineering technician of Motorola in the United States, invented the world's first civilian mobile phone. The development of VR technology is like mobile phones, no one can predict that a smart phone will appear in a few short years, and it is more likely to have a projection phone in the future. Even Mr. Kondo predicted that the 2020 Tokyo Olympics could use VR technology to watch gymnastics, marathons, pole vaults and others. (Note 10)

Since ancient times, the visual art of the East and the West not only has different media, but the spirit of expression is naturally different. The difference is in space and realism. Specifically, the virtual whiteness and linear aesthetics of oriental aesthetics have biggest differences. In 2016, Taipei National Palace Museum and Professor Hong Yizheng of Taiwan University cooperated with two groups of VRs, namely, Cave 61 of Dunhuang Mogao Grottoes and Zhao Mengfu of Yuan Dynasty. They also officially introduced Oriental art elements into VR technology. Recently, more and more people have invested in this technology industry. The study also has attempted to find another innovative creative performance for VR technology in personal modern ink painting. This film has not only applied traditional oriental visual art concept, but also created a virtual world space of oriental

aesthetics. Perhaps in the future, it will bring a new performance to oriental art.

Whether VR can be popularized in the future, I think there are two prerequisites. 1. Improvement and leaping forward of hardware devices: Head-mounted devices do not need to go directly to the virtual world through computers. 2, Diversified software: current VR industry chain trend is set in education, games, movies; there must be more relevant companies and designers to be involved in so as to make virtual reality faster, more real or more interesting.

Note 10: SHIN KIYOSHI (2017) "VR Shock" Taipei City: Cite Publishing Ltd. Page 163

Fig.

Wang Yiming 2011 ink paintings work

"PRAJNA PARAMITA"120X90CM
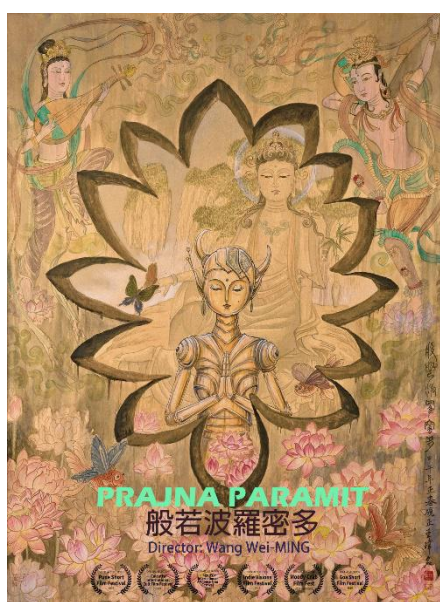
A poster designed with original paintings

"PRAJNA PARAMITA" VR Ink Animation Movie QRC

Positive image in the VR film "PRAJNA PARAMITA"

The back view of the VR film "PRAJNA PARAMITA"
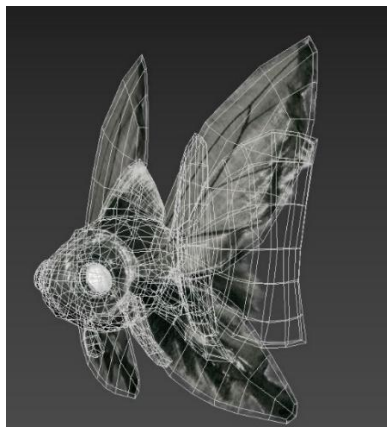
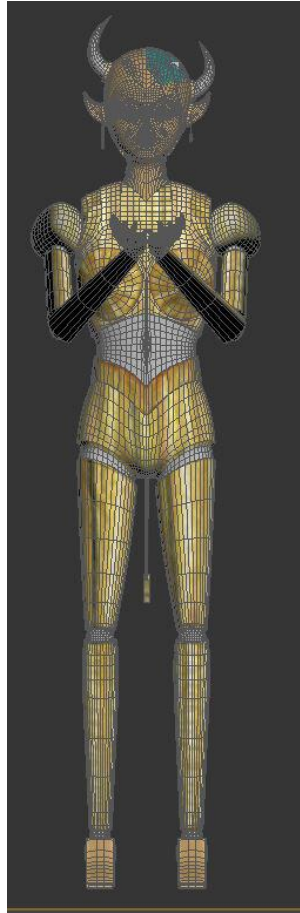**Comparison of butterfly fish 3D modeling and ink block**
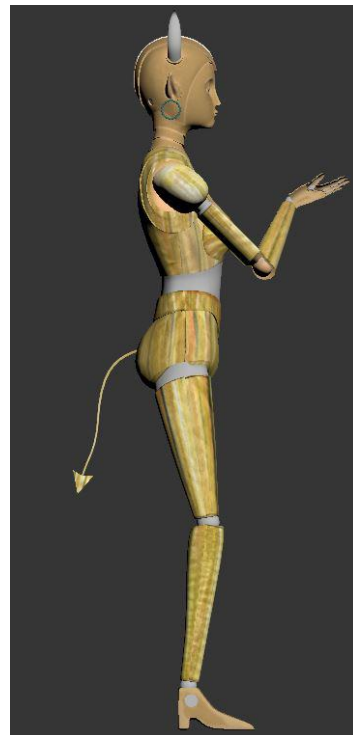
Comparison of butterfly fish 3D modeling and color ink block

Comparison of lotus 3D modeling and ink block

Comparison of lotus 3D modeling and color ink block
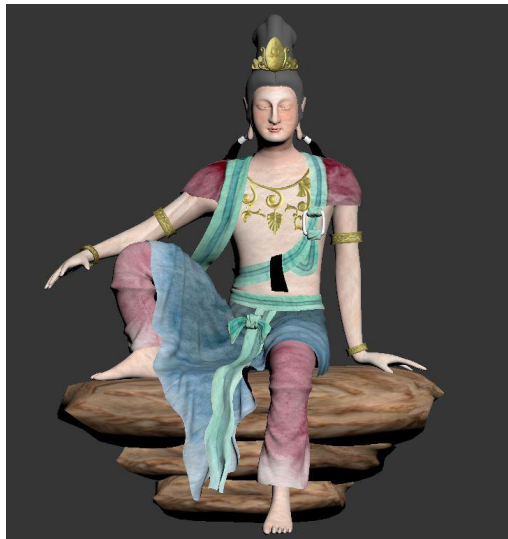
Comparison of robot front 3D modeling and color ink block

Comparison of robot side 3D modeling and color ink block

Liao Dynasty's Guanyin wood carving   **Water Moon Guanyin 3D Modeling**
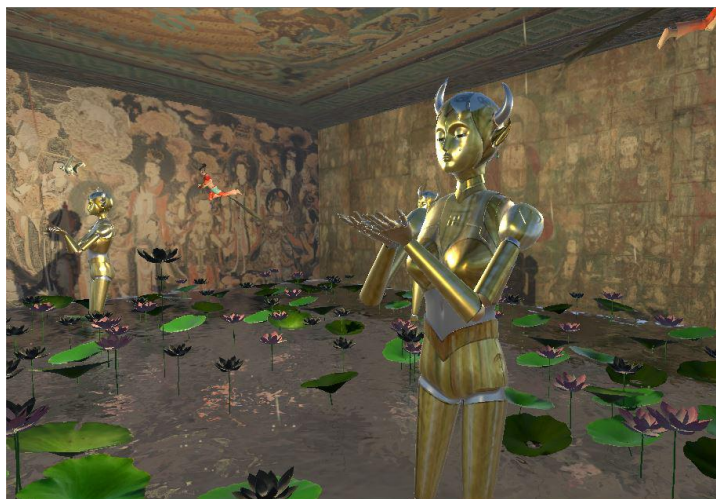
of Water Moon

Water Moon Guanyin ink block of the study

Flying Fairy 3D modeling and color ink block

Scene of "PRAJNA PARAMITA"

Scene of "PRAJNA PARAMITA"

Scene of "PRAJNA PARAMITA"

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